Using Quality Residuals To Build Soil

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Common and Uncommon Feedstock

Crop residual, Food processing residual, Orange, carrot, banana and apple pulp, Livestock manure, Dog manure, Zoo doo, Biosolids-human manure, Coir, chipped Christmas trees, Mixed leaf and Yard residual, Eggs/egg shell, Mixed food waste (residential, grocery, school, restaurant, etc.) Out dated soda and alcohol, glucose solutions, Brewery waste from, micro-breweries, Fruit leather residual, Currency (from the US Mint), Burnt grain from an elevator fire, Cherry/stone fruit pits , Garlic/ onion processing residual, Paper from document destruction, Bread dough/bakery excess, Seized and legal cannabis, residual, Floral and cut flower production waste, Coffee/tea grounds, Cocoa, coffee, rice hull, Off-spec. pet food, Dog and cat treat dust, Off-spec. human food, Canned and contained, foods, residual from fish canneries and slaughterhouses, Fruit & Vegetable peelings, Acai, Grape, Apple, Olive pressings, Poultry feathers, Livestock wool, Butcher residuals, Blood: liquid, semi-solid or dried, whales & marine mammals, Fish from fish kills, Sea weed/ lake weed, Seafood shell, Fish and fish guts, Paper, Vanilla bean residual, Sunflower seed shell, biochar, whey- all different compositions, Milk/ice cream, Liquid manure, FOG: fats-oils-greases, Gummy vitamin residual, Gel caps from drug manufacturers, Coir, Bagasse, Drywall/ untreated wood, Deadstock, feed, water, eggs, milk & bedding/litter from disease outbreaks.

Questions Compost Buyers Might Ask

1. What feedstock are used to make compost? What carbon source is used?
2. Are any generated Off-Farm? If yes which ones?
3. Are Copper Sulfate or Formaldehyde used on farm?
4. Are pesticides and herbicides used? For what use?

Questions Compost Buyers Might Ask (con't)

5. How long is material composted, and by which method?
6. Has hay or bedding been imported from mid west or west?
7. Is it screened and size of screen?
8. Has compost been tested? Are results available?

Feedstock

Food waste
Food processing
Manure
Leaf and yardwaste
Biosolids-humanure
Fish/meat waste
Woody waste
Lake weeds

Organics = 60% or more of our waste stream

Crop Requirements & Soil Testing

- Test soil nutrients
- Organic Material-Can you have too much
- pH
- Know crop requirements

Leaf & Yard Residuals

Inerts- garbage

Herbicides/Pesticides

Lead

Salt Level

Quality Issues

- Low Nutrient
- High Carbon
- Organic Matter
- Chemicals-pesticides

Food Scrap & Processing Residual

- High in Salt
- Physical Contaminants
- Varies with Feedstock
- Serviceware

Manure Compost

- High in Organic Matter ?
- Low in contaminants
- Little garbage or inerts
- Can be high in P
- Pharmaceuticals

Manure Compost Samples

Average values for selected analytes

	pH	% Organic Matter	Fecal Coliform MPN/g (range)	Weed Seeds Count/L
1A (n=6)	7.8	67	<2 to 800	1
2B (n=4)	7.7	28	<2 to 2	1
3F (n=6)	8.5	68	17 to 3500	0
3FB (n=4)	8.3	55	<2 to 11	0
4G (n=4)	7.9	24	<2 to 140	3
4GB (n=4)	7.9	25	140 to 1700	8
5H (n=4)	7.8	57	11 to 700	0
6PB (n=4)	7.9	87	1300 to 28000	0
7WA (n=5)	6.5	38	<2 to 300	6
8WI (n=6)	7.8	43	<2 to 2	98

Metal Results

	As	Cd	Cu	Hg	Pb
1A	<2.3	2.1	509.3	0.023	17
2B	6.3	1.6	34.9	0.039	24
3F	<2.3	2.4	529.0	0.029	19
3FB	<2.3	2.4	265.0	0.029	29
4G	18	3.6	28.9	0.024	56
4GB	29	3.6	30.1	0.057	58
5H	34	4	366.0	0.05	17
6PB	17	2.8	32.0	0.026	<8
7WA	5.7	1.7	26.1	<0.02	20
8WI	23	2.2	777.7	0.032	20
NYS Soil	<9	0.2	20	0.1	15
NYS 360		25	1000	10	250

(dry basis unless specified) (units ppm)

- Manure Solids or DMS
- Supply Crop Nutrients
- Further Stabilize

Composting Bedded Pack

Fat, Oils, Meat

- Highest in Nutrients
- Physical Contaminants
- Use Limitations

Biosolids Compost

- Inerts
- Chemical Contaminant
- Bacteria
- Viruses
- Drugs
- Change in feedstock
- Use Limitations

Pathogens

Fecal < 1000 MPN/g or Salmonella s.p. < 3 MPN/4g (based on seven individual samples per event)

AND

Use one of 5 approved methods to Further Reduce Pathogens:

– Time/temp depending on solids content
– pH/time then dry to at least 50% solids
– Testing for enteric viruses/viable helminth ova
– Testing for reduction of these analytes

Trade-Offs/Decision

Improve pad surface:

- Increased OM
- Significantly higher nitrogen

Soil pad:

- Lower organic matter
- Loose more TKN
- Cause nutrient concentration issue

Leaf & Yard Residuals

Inerts- garbage

Herbicides/Pesticides

Lead

Salt Level

Leaf case study
"investing in soil quality"

Assumption:
municipal leaves are full of trash and have no nutrients

Rutgers research:
20 tons/acre of leaves can add 400 lbs of nitrogen, 40 lbs of phosphorous, 152 lbs of potassium, 656 lbs of calcium, 96 lbs of magnesium, 58 lbs of iron, 44 lbs of sulfur, 22 lbs of manganese, and 1.5 lbs of boron to the soil.

None of that's readily available, but it will be over time.

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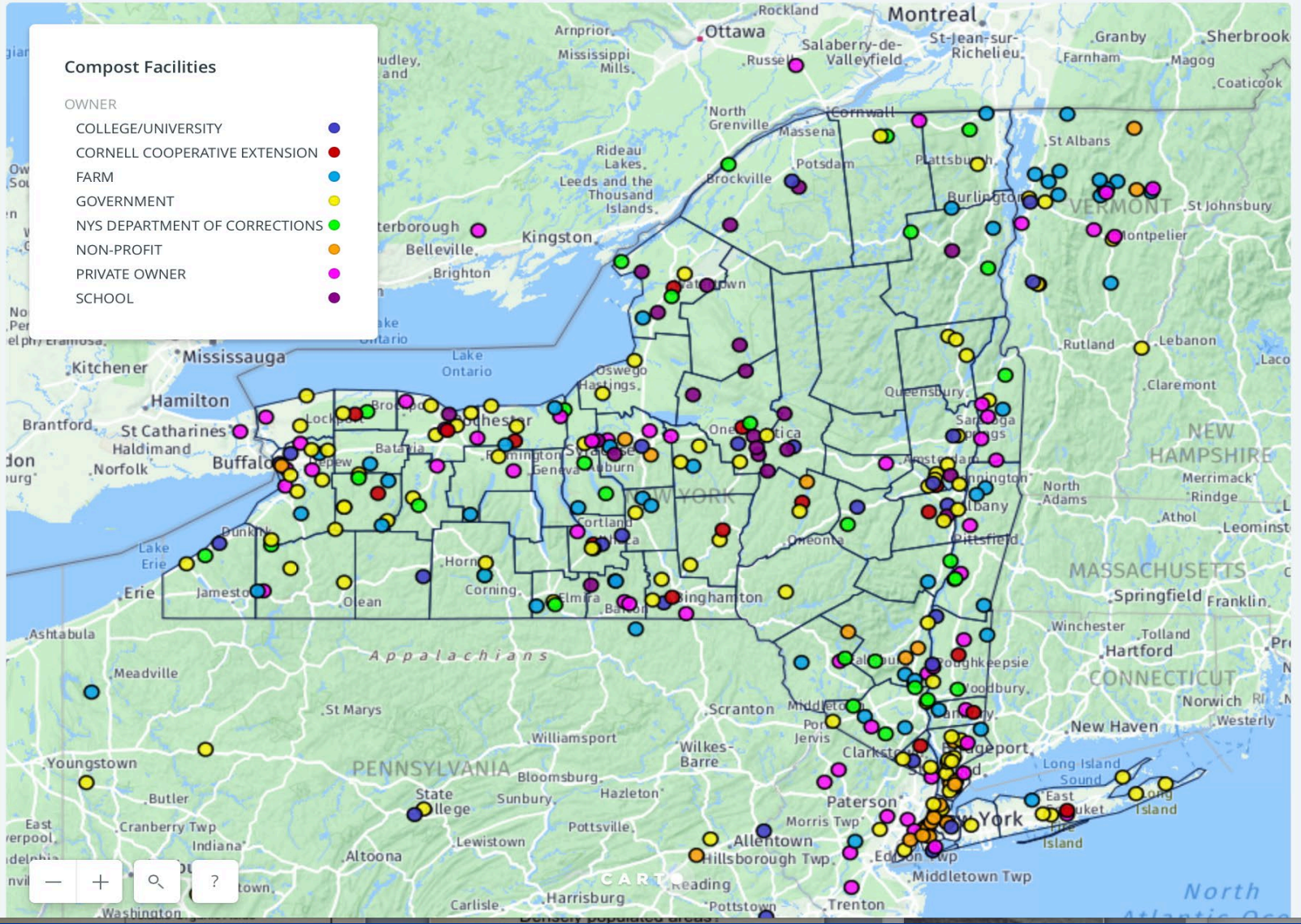
To search the map: Hovering over a dot displays the facility name and services. Clicking on a dot displays all information available about the facility. To search the map for a facility, click on the magnifying glass (bottom left) and enter the city and state of the general area you are searching for the facility.



Improves Highly Compacted Soils

Corn Trials in Washington Co.

Seedling corn on July 7, 13 days after planting.

Corn on July 30 when mid-season soil samples were taken. Notice that the corn across the plots is quite uniform.

Microdosing Crops

- Ideally we would feed all of the soil equally—
  In area where there is a shortage of compost or where we can not generate or purchase enough compost to cover acres micro-dosing can help build soil and affect plant growth.
- In conventional ag we do this with chemical fertilizers, place the fertilizers where the plants need them.

How to Apply Biochar and Compost

- Prepare the furrow or planting hole
- Place small amounts of biochar and compost in the furrow and cover with soil
- Plant seeds

In furrow micro dosing

Beans with compost

Compost Socks


Dryden


Undercut bank


4 months later

Socks in road ditches


KUBOTA

Soil placed on top of Compost??

Slope failure -blanket was improperly built

Wetland Mitigation in Adirondack Park

Establishing Vegetation

Vegetated Filter strip

April 2018

July 2018


2017/03/09

Brooktondale

Eroding Stream Bank

Swale at Upper Buttermilk

Hydro-seed with Road Kill Compost/Soil Mix

Application to 1:1 ROCK SLOPE
2” compost mulch w/native seed mix
Barton Creek Development – Austin, TX
AUGUST 17, 2002

8 MONTHS LATER
IRRIGATION INSTALLED, NEVER USED

West Cypress Hills on October 05, 2004. Before Compost Application


JAN 11 2005


3 years without amendment


3 years with compost

Spreading Compost Product

Recycling Organics Makes Good Sense!

Healthy Soils = Healthy Food!

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Compost Parameter	Typical NYS Range		Description
PHYSICAL PROPERTIES	**Dairy***	**Poultry****	
Water holding capacity (%)	88-243	88-173	The amount of water that can be retained by compost and is available to plants.
Organic matter (%)	18-70	24-54	Material in compost that came from, or is, living matter and is composed of plant residues, microorganisms, and humus. Organic matter can often be used to determine the extent of decomposition in a compost pile. Very low organic matter may indicate heavy mixing of non-organic soil matter.
Carbon to nitrogen ratio (C:N)	11-19	4-16	A value obtained by comparing total carbon to total nitrogen. This value is one of several factors used to measure the rate of compost decomposition, though it should never be used as the only indicator.
Density (lb/ft^3)	38-58	30-60	Provides a measure of how easily air and water can move through a compost pile. Lower means better flow and higher means poorer flow.
Moisture (%)	23-53	51-78	Measure water content. Moisture content changes over time as organic matter is broken down, but ideal range is 60% to 80%.
Inert or oversize matter (%)	1-11	1-10	Any material that does not have nutritive of chemical value in compost, such as rocks, pebbles, glass, plastic, and other debris or matter.
PLANT NUTRIENTS	**Dairy***	**Poultry****	
Total nitrogen (%)	1-3	1-7	A measure of total nitrogen. This value includes both organic and inorganic forms of nitrogen in compost. In mature composts, most nitrogen should be organic, which indicates that a compost is mature.
Organic nitrogen (%)	1-3	1-7	The fraction of total nitrogen that is chemically associated with carbon in some form. In mature composts, organic nitrogen should explain most of total nitrogen presence.
Phosphorus (%)	0.2-1	0.3-2	An important plant macronutrient and mineral. In excess, a potential environmental contaminant.
Potassium (%)	0.2-2	0.3-3	An important plant macronutrient and mineral. Important for water movement into and out of plant cells.
Calcium (%)	1-6	6-15	An important macronutrient. Component of plant cell walls and enzymes.
Magnesium (%)	0.4-1	0.5-1	An important macronutrient. Important part of plant energy production from sunlight.
Nitrates (ppm)	<2-878	<2-2033	A form of inorganic nitrogen that is readily available to plants.
Nitrites (ppm)	<2-3	<2-<2	A form of inorganic nitrogen produced under certain conditions from ammonia that is toxic to plants. Elevated levels in compost may cause damage to plants.
Chloride (ppm)	137-	270-	Plant micronutrient. Important for cellular water transport and plant energy

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Chloride (ppm)	137-6650	270-10471	Plant micronutrient. Important for cellular water transport and plant energy production.
Sulfates (ppm)	<4-898	55-3060	A form of sulfur, which is a plant macronutrient. Important for general plant functions.
Copper (ppm)	26-572	16-93	Plant micronutrient, but toxic to plants at elevated levels. If copper sulfate is used in agricultural settings, then compost should be tested for copper.
Iron (ppm)	1106-13886	293-10765	Plant micronutrient.
Zinc (ppm)	99-349	171-597	Plant micronutrient, but toxic to plants at elevated levels.
Ammonia	4-18	644-2347	Toxic to plants. In compost, animal excretions are a common source. A source of available nitrogen.

HEALTH CONCERNS	**Dairy***	**Poultry****	
Cadmium (ppm)	1-4	2-5	A potential health risk and potential environmental contaminant.
Arsenic (ppm)	<6.5-14	<6.5-15	A potential health risk and potential environmental contaminant.
Fecal coliforms (most probable number/gram)	<3-6580	<3-7	An indicator or relative health risk from bacteria that grow in conditions matching that of the human digestive tract. Note – Many fecal coliforms don't cause illness, but grow in similar conditions as those microbes that do.
Salmonella (most probable number/4 grams	1.2-3.0	1.0-1.1	An indicator of relative health risk. Note – only select species of *Salmonella* cause illness, and conditions must also be ideal for sickness to occur.

PLANT RESPONSE	**Dairy***	**Poultry****	
% germination	88-105	9-102	Percent of cress germinating in control vs compost (diluted to standard salinity).
% growth	57-102	12-113	Weight of cress grown in control vs compost (diluted to standard salinity). Expressed as %.
Weed seeds	0-16	0-12	Weed seeds are undesirable in gardening, potting soils, and other applications. Weed seed counts are valuable for ensuring low values.

NYS DEC Rules for Metals Content in Residuals

Materials shall not exceed the following levels and be expressed in parts per million(ppm) on a dry weight basis.

As	Ba	Cd	Cr	Cu	Pb	Hg	Mo	Ni	Zn
41	1000	10	100	1500	250	10	54	200	2500